



DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE-2020-BT-TP-0016]

RIN 1904-AF02

Energy Conservation Program: Test Procedure for Walk-In Coolers and Walk-In Freezers

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Final rule.

SUMMARY: This final rule amends the current test procedure for hot gas defrost unit coolers by making it consistent with a recent update to the industry testing standard that is incorporated by reference in the relevant Federal test procedure for walk-in freezer refrigeration systems. This final rule updates the equations used to calculate defrost energy and heat contributions applicable to these systems to provide a consistent performance evaluation between hot gas defrost and electric defrost unit coolers when tested alone.

DATES: The effective date of this rule is [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]. The final rule changes will be mandatory for product testing starting [INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

ADDRESSES: The docket, which includes *Federal Register* notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials, is available for review at <http://www.regulations.gov>. All documents in the docket are listed in the <http://www.regulations.gov> index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

A link to the docket web page can be found at <https://beta.regulations.gov/search/docket?filter=%20EERE-2020-BT-TP-0016>. The docket web page contains instructions on how to access all documents, including public comments, in the docket. For further information on how to review the docket contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: ApplianceStandardsQuestions@ee.doe.gov.

FOR FURTHER INFORMATION CONTACT:

Dr. Stephanie Johnson, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-2J, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1943. E-mail: WICF2020TP0016@ee.doe.gov.

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-8145. E-mail: Michael.Kido@hq.doe.gov.

Table of Contents

- I. Authority and Background
 - A. Authority

- B. Background
- II. Synopsis of the Final Rule
- III. Discussion
 - A. Scope of Applicability
 - B. Calculation of Defrost Energy and Heat Contribution for Hot Gas Defrost Unit Coolers Tested Alone
 - C. Effective and Compliance Dates
 - D. Test Procedure Costs, Harmonization, and Other Topics
 - 1. Test Procedure Costs and Impact
 - 2. Harmonization with Industry Standards
- IV. Procedural Issues and Regulatory Review
 - A. Review Under Executive Order 12866
 - B. Review Under Executive Orders 13771 and 13777
 - C. Review Under the Regulatory Flexibility Act
 - D. Review Under the Paperwork Reduction Act of 1995
 - E. Review Under the National Environmental Policy Act of 1969
 - F. Review Under Executive Order 13132
 - G. Review Under Executive Order 12988
 - H. Review Under the Unfunded Mandates Reform Act of 1995
 - I. Review Under the Treasury and General Government Appropriations Act, 1999
 - J. Review Under Executive Order 12630
 - K. Review Under Treasury and General Government Appropriations Act, 2001
 - L. Review Under Executive Order 13211
 - M. Review Under Section 32 of the Federal Energy Administration Act of 1974
 - N. Congressional Notification
- V. Approval of the Office of the Secretary

I. Authority and Background

Walk-in coolers and walk-in freezers ("WICFs" or "walk-ins") are included in the list of "covered equipment" for which the U.S. Department of Energy ("DOE") is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6311(1)(G)) DOE has established test procedures and standards for the principal components that make up a walk-in: Panels, doors, and refrigeration systems. See title 10 of the Code of Federal Regulations ("CFR") part 431 subpart R. Relevant to this document, DOE has established standards for walk-in freezer refrigeration systems as a component of walk-in freezers at 10 CFR 431.306, and test procedures for walk-in freezer refrigeration systems at 10 CFR 431.304(b)(4) and appendix C to subpart R of part 431 ("Appendix C"). The following sections discuss DOE's authority to establish test procedures for walk-ins and relevant background information regarding DOE's consideration of the procedures in Appendix C relevant to hot gas defrost unit coolers.

A. Authority

The Energy Policy and Conservation Act, as amended ("EPCA"),¹ authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part C² of EPCA, added by Public Law 95-619, title IV, §441(a), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. As amended by the Energy Independence and Security Act of

¹ All references to EPCA in this document refer to the statute as amended through America's Water Infrastructure Act of 2018, Public Law 115–270 (Oct. 23, 2018).

² For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A-1.

2007, Public Law 110-140 (Dec. 19, 2007), this equipment includes walk-ins, the subject of this document. (42 U.S.C. 6311(1)(G))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA include definitions (42 U.S.C. 6311), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), energy conservation standards (42 U.S.C. 6313), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

The Federal testing requirements consist of test procedures that manufacturers of covered equipment must use as the basis for: (1) certifying to DOE that their equipment complies with the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6316(a); 42 U.S.C. 6295(s)), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). Similarly, DOE uses these test procedures to determine whether the equipment complies with relevant standards promulgated under EPCA. (42 U.S.C. 6316(a); 42 U.S.C. 6295(s))

Federal energy efficiency requirements for covered equipment established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6316(a) and (b); 42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6316(b)(2)(D))

Under 42 U.S.C. 6314, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending the test procedures for covered equipment. EPCA

requires that any test procedures prescribed or amended under this section shall be reasonably designed to produce test results that reflect the energy efficiency, energy use or estimated annual operating cost of a given type of covered equipment during a representative average use cycle (as determined by the Secretary) and shall not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2))

EPCA provides specific requirements for determining the R value for certain walk-in components. (42 U.S.C. 6314(a)(9)(A)(i)-(iv)) In addition, EPCA requires that DOE establish test procedures to measure walk-in energy use. (42 U.S.C. 6314(a)(9)(B)(i)) DOE satisfied this requirement when it first established test procedures for this equipment in 2011. See generally, 76 FR 21580 (April 15, 2011) (final rule establishing test procedures for walk-in equipment). See also 10 CFR 431.304 and 10 CFR part 431, subpart R, appendices A through C.

If DOE determines that a test procedure amendment is warranted, it must publish a proposed test procedure and offer the public an opportunity to present oral and written comments on it. (42 U.S.C. 6314(b))

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered equipment, including walk-ins, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle. (42 U.S.C. 6314(a)(1)) In addition, if the Secretary determines that a test procedure amendment is warranted, the Secretary must publish proposed test procedures in the *Federal Register*, and afford

interested persons an opportunity (of not less than 45 days' duration) to present oral and written data, views, and arguments on the proposed test procedures. (42 U.S.C. 6314(b))

If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. (42 U.S.C. 6314(a)(1)(A)(ii))

DOE is publishing this final rule in satisfaction of its obligations specified in EPCA. (42 U.S.C. 6314(a))

B. Background

On May 13, 2014, DOE published a test procedure final rule ("May 2014 final rule") that accommodated testing of complete refrigeration systems and for the individual components of split systems to be tested separately. 79 FR 27388, 27398. A split-system refrigeration system consists of two separate components: a unit cooler,³ which is installed inside a walk-in enclosure, and a condensing unit,⁴ which is installed outside the enclosure, either inside a building in which the walk-in is constructed, or outdoors. The amendments finalized in the May 2014 final rule accommodate testing of the entire "matched pair" refrigeration system (*i.e.*, a condensing unit and unit cooler together), the condensing unit alone, or the unit cooler alone. When testing an individual component alone, the energy use attributed to the other system component is represented by a default value or by using a default performance characteristic. Specifically, when testing a unit cooler alone, the condensing unit energy use is determined using the representative

³ A unit cooler is defined as an assembly, including means for forced air circulation and elements by which heat is transferred from air to refrigerant, thus cooling the air, without any element external to the cooler imposing air resistance. 10 CFR 431.302.

⁴ A condensing unit, for the purposes of DOE walk-in refrigeration system testing, is an assembly that (1) includes 1 or more compressors, a condenser, and one refrigeration circuit; and (2) is designed to serve one refrigerated load. 10 CFR 431.302.

energy efficiency ratio (“EER”) specified for the appropriate adjusted dew point temperature in Table 17 of Air Conditioning, Heating, and Refrigeration Institute (“AHRI”) Standard 1250-2009 (“AHRI 1250-2009”). Energy use of the unit cooler's components, *i.e.*, its evaporator fan(s) and its electric defrost heater (for units that use electric defrost),⁵ is directly measured during the test. Conversely, when testing a condensing unit alone, the compressor and condenser fan energy are directly measured, while the energy use of the components of the unit cooler are represented by default values. The test procedure provides default values for the evaporator fans, and, for low-temperature refrigeration systems, the energy use and heat load associated with defrost.⁶ See Appendix C, Sections 3.4.2 through 3.4.5. The default defrost energy and heat values are based on representative energy use of electric defrost, by far the most common form of defrost. Electric defrost consists of electric resistance heaters built into the evaporator coil and the unit cooler drain pan that are energized occasionally during the day to warm the coil and melt the frost.

Additionally, the May 2014 final rule established a method for determination of annual energy walk-in factor (“AWEF”) for refrigeration systems with “hot gas” defrost, using nominal values to represent the energy use and heat load of this method. 79 FR 27388, 27401. Rather than using electric resistance coils embedded in the evaporator for defrosting, hot gas defrost uses refrigerant to transfer heat to the evaporator. That heat may be transferred from the ambient air outside the walk-in, but heat for defrosting can

⁵ Electric defrost consists of electric resistance heaters built into the evaporator coil and the unit cooler drain pan that are energized occasionally during the day to warm the coil and melt the frost.

⁶ Defrost is required to remove frost from the evaporator coils of refrigeration systems, which collects during the refrigeration system on-cycle as water vapor in the air freezes onto the cold evaporator surfaces. Defrost capability is required for freezers, but is optional for coolers, since the surrounding walk-in interior temperature is above freezing temperature and thus can melt the frost between on-cycles in many walk-in cooler applications.

also be transferred from the compressor or a thermal storage component that stores heat generated during the compressor on-cycle. DOE notes that, unlike the default values for electric defrost, which are required for use only when testing condensing units, the hot gas defrost nominal values were to be used for any system using hot gas defrost (see §431.303(c)(10)(xii) as finalized in the May 2014 final rule for unit coolers and complete refrigeration systems (e.g., matched pairs) and see §431.303(c)(12)(ii) as finalized in the May 2014 final rule for condensing units). 79 FR 27388, 27413-27414.⁷ The application of the hot gas defrost nominal values was established for all system configurations because an appropriate test method to accurately measure hot gas defrost that would not be unduly burdensome to conduct had not been developed. 79 FR 27388, 27401. As such, energy use and heat load default values were established for both hot gas defrost unit coolers and condensing units tested alone that use hot gas defrost. (The default values for calculating hot gas defrost energy and heat load established in the May 2014 final rule were much lower than the default values established for calculating energy use and heat load for electric defrost; thus, use of these values represented a “hot gas defrost credit.”)

DOE most recently amended the test procedures for the performance requirements for walk-in refrigeration system components (e.g., refrigeration systems such as unit coolers), in a final rule published on December 28, 2016. 81 FR 95758 (“December 2016 final rule”). That rule adopted a series of amendments to provisions affecting certain walk-in refrigeration systems, including removal of the performance credit for hot gas defrost systems. As established in the December 2016 final rule, a hot gas defrost

⁷ These requirements were later removed in a test procedure final rule published on December 28, 2016. 81 FR 95758, 95774-95777.

condensing unit is tested without measuring the impacts of the hot gas defrost feature, and that feature will not affect the measured efficiency either positively or negatively. *See id.* In that sense, the test procedure for condensing units with hot gas defrost is the same as the test procedure for units with electric defrost. *Id.* These amendments had their initial origins as part of rulemaking negotiations held under the Appliance Standards and Rulemaking Federal Advisory Committee ("ASRAC"). See 80 FR 46521 (August 5, 2015) (establishing a WICF Working Group under ASRAC). DOE assigned to hot gas defrost unit coolers the same default values for electric defrost heat and energy use calculations that the test procedure assigns to dedicated condensing units that are not matched with a unit cooler for testing (*i.e.*, tested alone). 81 FR 95758, 95776. The default electric defrost energy and heat values were validated by testing unit coolers with measured gross capacity up to 18,000 Btu/h.⁸ The approach adopted in the December 2016 final rule remains the current test method for addressing hot gas defrost.

Relatedly, DOE published a final rule on July 10, 2017, that adopted energy conservation standards for WICFs. 82 FR 31808 ("July 2017 final rule"). The analysis supporting the development of these standards considered only electric defrost walk-in refrigeration systems. Compliance with the amended energy conservation standards established in the July 2017 final rule has been required beginning July 10, 2020. *Id.*

In general, the current DOE test procedure requires testing of WICF refrigeration systems to be conducted pursuant to AHRI 1250-2009, with certain clarifications and modifications. Section 3.0 of Appendix C. Since the December 2016 final rule, AHRI has published a revised version of the 1250 standard, AHRI 1250-2020. AHRI 1250-

⁸ See Docket EERE-2015-BT-STD-0016, No. 0007 at p. 31.

2020 includes revised equations for calculation of the default electric defrost energy and heat load for condensing units tested alone, which are significantly less than the values in Appendix C. AHRI notified DOE on May 21, 2020 that some high-capacity hot gas defrost units might not comply with the energy conservation standards for which compliance has been required since July 10, 2020.⁹

DOE published a notice of proposed rulemaking (“NOPR”) on September 28, 2020, in which DOE proposed to amend the WICF test procedure to revise the defrost energy and heat contribution values for hot gas defrost unit coolers. 85 FR 60724 (“September 2020 NOPR”). DOE held a public meeting via webinar related to this NOPR on October 2, 2020. That proposal serves as the basis for this final rule.

II. Synopsis of the Final Rule

This final rule amends section 3.5 of Appendix C of the current test procedure, which assigns defrost energy and heat contribution values for hot gas defrost unit coolers tested alone, by incorporating equations consistent with Section C10.2.2 of Appendix C of AHRI 1250-2020 (including equations C46 through C49, which address electric defrost energy use for dedicated condensing units tested alone).¹⁰

Table II.1 summarizes the adopted amendments, compares the amendments to the current test procedure, and states the reason for the adopted change.

⁹ Available at <https://regulations.gov/comment/EERE-2020-BT-TP-0016-0007>.

¹⁰ DOE modified equation C49 by removing the divisor of 1.0 to simplify the equation. This change does not affect the result.

Table II.1 Summary of Changes in the Amended Test Procedure

Current DOE Test Procedure	Amended Test Procedure	Attribution
Defrost energy and heat contribution for hot gas defrost unit coolers are determined based on the calculation for electric defrost for dedicated condensing units that are not matched for testing.	Revise defrost energy and heat contribution values for hot gas defrost unit coolers to be consistent with the electric defrost energy use and heat contributions from section C10.2.2 in Appendix C of AHRI 1250–2020.	Industry Test Procedure update

DOE has determined that the narrow amendments described in section III and adopted in this final rule would better evaluate the measured efficiency of the walk-in refrigeration system equipment using hot gas defrost compared to the current procedure, and that this narrow amendment will not cause the test procedure to be unduly burdensome to conduct. Discussion of DOE’s actions are addressed in detail in section III of this document.

The effective date for the amended test procedures adopted in this final rule is 30 days after publication of this document in the *Federal Register*. Representations of energy use or energy efficiency must be based on testing in accordance with the amended test procedures beginning 180 days after the publication of this final rule. (See 42 U.S.C. 6314(d))

III. Discussion

The following sections describe the scope of equipment for which this final rule applies, the calculations that support this final rule, and effective compliance dates. DOE received comments in response to the September 2020 NOPR from the interested parties listed in Table III.1.

Table III.1 September 2020 NOPR Written Comments

Commenter(s)	Reference in this Final Rule	Commenter Type
Air-Conditioning, Heating & Refrigeration Institute	AHRI	Trade Association
California Investor-Owned Utilities	CA IOUs	Utility
Northwest Energy Efficiency Alliance	NEEA	Efficiency Organization
People's Republic of China	PRC	Country Official/Agency

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.¹¹ The comments received and DOE's decisions regarding finalization of the test procedure amendments are discussed in the sections that follow.

A. Scope of Applicability

In this final rule, DOE is amending the test procedure for hot gas defrost unit coolers only.

DOE defines a “walk-in cooler and walk-in freezer” as an enclosed storage space refrigerated to temperatures, respectively, above, and at or below 32 degrees Fahrenheit that can be walked into, and has a total chilled storage area of less than 3,000 square feet (excluding products designed and marketed exclusively for medical, scientific, or research purposes). 10 CFR 431.302.

¹¹ The parenthetical reference provides a reference for information located in the docket of DOE’s rulemaking to amend the WICF test procedure. (Docket No. EERE-2020-BT-TP-0016, which is maintained at <http://www.regulations.gov/#!docketDetail;D=EERE-2020-BT-TP-0016>). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

DOE defines a “*unit cooler*” as an assembly, including means for forced air circulation and elements by which heat is transferred from air to refrigerant, thus cooling the air, without any element external to the cooler imposing air resistance. A unit cooler is a “refrigeration system,” which DOE defines as the mechanism (including all controls and other components integral to the system's operation) used to create the refrigerated environment in the interior of a walk-in cooler or walk-in freezer, consisting of: (1) a dedicated condensing refrigeration system (as defined in 10 CFR 431.302); or (2) a unit cooler.

DOE has determined that its current test procedure provides results that are not essentially the same for hot gas defrost unit coolers and electric defrost unit coolers, as intended in the December 2016 final rule. As a result, not only might the values from using the procedure’s calculations be unrepresentative, but it may not be possible for certain hot gas defrost unit coolers to comply with the applicable energy conservation standards using the current test procedure’s default calculations.

B. Calculation of Defrost Energy and Heat Contribution for Hot Gas Defrost Unit Coolers Tested Alone

As discussed in the September 2020 NOPR, certain manufacturers and AHRI informed DOE that the test method for hot gas defrost unit coolers does not provide results that are comparable to the results for electric defrost unit coolers. 85 FR 60724, 60728. As such, hot gas defrost unit coolers above a certain capacity may, when tested under the current procedure, produce unrepresentative values and have difficulty demonstrating compliance with the relevant standards. As discussed, the DOE test procedure determines the AWEF of hot gas defrost unit coolers by using the default

electric defrost energy use and heat load values from the test procedure for condensing units tested alone. Appendix C Sections 3.5.2, 3.4.2.4, and 3.4.2.5.

Using the defrost energy and heat load values in the test method prescribed in Appendix C of the current test procedure, Table III.2 compares hypothetical, best-case AWEF values assuming the unit cooler fans draw zero power (an impossible situation) and AWEF values using representative unit cooler fan wattages at different gross capacity levels.¹² These are the same values used to represent electric defrost energy and heat values for determining the AWEF for condensing units tested alone. The zero-fan-watt AWEF levels are higher than would be achieved by max-tech unit coolers, since the calculations were done assuming that the unit cooler fans consume zero energy for illustrative purposes.

Hypothetical AWEF values were calculated as follows. Energy contributions included in the AWEF calculation for this case include compressor energy and defrost energy. The compressor energy is calculated as the unit cooler gross capacity, divided by a compressor system EER value prescribed in Table 17 of AHRI 1250-2009 for low-temperature unit coolers (*i.e.*, EER = 6.7), multiplied by a load factor representing percentage compressor run time. The load factor is equal to the walk-in enclosure thermal load plus the average per-hour defrost heat contribution divided by the unit cooler's net capacity. In this calculation, higher defrost energy and heat load values both reduce AWEF, with a higher AWEF value indicating more efficient performance. For

¹² Gross capacity is the cooling delivered by the refrigerant passing through the unit cooler evaporator. Net capacity or cooling effect is less than this value by an amount equal to the heat of the fans (*i.e.*, fan input power in Watts converted to heat in Btu/h by multiplying by 3.412) used to circulate air through the unit cooler.

unit coolers above a certain capacity—even for the hypothetical, impossible zero-fan-watt scenario—using the current default defrost energy and heat load values results in a lower AWEF than the current low-temperature unit cooler minimum standard.

Table III.2—Hot Gas Defrost Unit Cooler AWEF

Gross capacity (Btu/h)	AWEF Calculated Assuming Zero Fan Power (Btu/W-h)	AWEF Calculated Using Fan Power Correlations from AHRI 1250-2020 (Btu/W-h)*	Minimum AWEF standard (Btu/W-h)**
10,000	5.08	4.30	4.07
17,500	4.65	4.15	4.15
50,000	4.49	3.83	4.15
100,000	4.21	3.51	4.15
114,300	4.15	3.45	4.15
150,000	4.03	3.35	4.15
200,000	3.91	3.23	4.15

*Equation 173 in section 7.9.3.3. These correlations are representative for low temperature unit cooler evaporator fan power and are used in the test method prescribed in AHRI 1250-2020 for low temperature condensing units tested alone.

**Unit Cooler—Low, 10 CFR 431.306(e).

In April 2020, AHRI published an updated version of its AHRI 1250 test standard that revised the values for electric defrost energy use and heat contribution to apply when testing condensing units that are tested alone (see section C10.2.2 in Appendix C of AHRI 1250-2020). That update was partly based on testing using a sample of unit coolers equipped with electric defrost. Although the updated values specified in AHRI 1250-2020 are expressed as average per-hour contributions rather than daily contributions, they can be converted to daily contributions (by multiplying by 24) for comparison with the current DOE test procedure values. The daily values determined using AHRI 1250-2020 are significantly lower than those in the current DOE test procedure, as indicated in Table III.3.

Table III.3—Comparison of Unit Cooler Default Electric Defrost Energy and Heat Load Between Current DOE Test Procedure and this final rule

Gross Capacity (Btu/h)	Daily Defrost Energy Use, DF (Wh) Current DOE Test Procedure*	Daily Defrost Energy Use, DF (Wh) 2020 Final Rule	Daily Defrost Heat Load, Q_{DF} (Btu) Current DOE Test Procedure*	Daily Defrost Heat Load, Q_{DF} (Btu) 2020 Final Rule
10,000	4,088	2,400	13,300	7,800
50,000	31,600	10,400	102,300	33,600
100,000	76,100	18,000	247,000	58,500
150,000	128,000	27,000	413,000	87,600
200,000	184,000	36,000	595,000	117,000

* See Appendix C, Sections 3.4.2.4 and 3.4.2.5. Applicable for hot gas defrost unit coolers as required in Appendix C, Section 3.5.2.

As explained in the September 2020 NOPR, the AHRI 1250-2020 update also includes correlations for the energy use and heat load associated with hot gas defrost. These values were based on the testing of units with hot gas defrost. However, as also explained in the NOPR, DOE proposed to use the correlations developed for electric defrost rather than hot gas defrost, to achieve consistency between the ratings for hot gas and electric defrost unit coolers – which was the intent of the December 2016 Final Rule. *Id.*

DOE proposed to revise the test procedure for hot gas defrost unit coolers by revising the equations used to calculate energy and heat contributions for defrost consistent with those specified in Appendix C, Section C10.2.2 of AHRI 1250-2020.

Comments from AHRI supported DOE's approach to revise its test procedure for hot gas defrost unit coolers (AHRI, No. 6, p. 2). The CA IOUs supported the proposal as a short-term resolution to the issue with hot gas defrost unit coolers, since the current test procedure likely overestimates defrost load, particularly for higher capacity hot gas defrost unit coolers (CA IOUs, No. 4, p. 2).

In its comments, the PRC noted that defrosting using waste heat is more efficient than electric defrost and therefore DOE should not exclude hot gas defrost systems from the scope of the test (PRC, No. 3, p. 3). DOE understands the term “waste heat,” in this case, to mean hot gas defrost. DOE wishes to emphasize that it is maintaining the provisions to address hot gas defrost and that hot gas defrost unit coolers continue to be within the scope of Appendix C and required to comply with the relevant standards in 10 CFR 431.306.

NEEA recommended that DOE update the calculations for electric defrost unit coolers to be consistent with AHRI 1250-2020 to maintain consistency between hot gas defrost and electric defrost unit coolers (NEEA, No. 5, p. 5). DOE notes that defrost energy use for unit coolers with electric defrost is determined through testing using section 3.3.4 of Appendix C, which references section C11 of AHRI 1250-2009. As specified in section C11 of AHRI 1250-2009, the electric defrost unit cooler is operated at dry coil conditions until stable, at which point a defrost is initiated and the energy input and duration is measured. Defrost capabilities are built into electric defrost unit coolers, e.g. a coil heater is integrated into the evaporator coil and a pan heater is provided for the pan. The power source to activate these heaters for a laboratory test is the same power source used to operate the unit cooler fans to measure capacity. Hot gas defrost unit coolers cannot be tested in this way because the heat source necessary to achieve defrost is not incorporated into the equipment. Therefore, while default values are needed for hot gas defrost unit coolers, they are not needed for electric defrost unit coolers, as the energy use associated with the electric defrost is measured in the test method.

DOE received several comments urging it to conduct a more comprehensive rulemaking that fully addresses recommendations from the 2016 Working Group. As

noted earlier, the CA IOUs supported the proposed amendments as a short-term measure; however, they encouraged DOE to address more fully the recommendations from the 2015 Working Group in a future rulemaking (CA IOUs, No. 4, p. 2). NEEA also urged DOE to expand the scope of the current walk-in test procedure revisions to address more fully the recommendations from the ASRAC working group, specifically recommendation 6 (NEEA, No. 5, p. 5). Additionally, the PRC suggested that DOE include modifications to the test to improve its ability to evaluate systems that utilize hot gas defrost (PRC, No. 3, p. 3).

DOE notes that Working Group Recommendation No. 6 includes incorporating off-cycle power consumption, rating variable-capacity condensing units, and developing a method for measuring hot gas defrost and adaptive defrost energy consumption. See Docket No. EERE-2015-BT-STD-0016, No. 56 at p. 3 (ASRAC Term Sheet, Recommendation No. 6 -- Future Test Procedure Recommendations. See also 81 FR 95758, 95761 (discussing ASRAC recommendations). As recognized by NEEA, additional changes to the DOE test procedure in response to Working Group Recommendation No. 6 would necessitate an evaluation of whether any such changes would impact compliance with the energy consumption standards for walk-ins (NEEA, No. 5, p. 3). DOE will continue to evaluate the Working Group recommendations and address additional changes as may be needed in a separate rulemaking.

NEEA encouraged DOE to conduct further analysis into AHRI 1250-2020 to understand if it appropriately addresses the Working Group recommendations. (NEEA, No. 5, p. 3) The CA IOUs commented that the equations in the DOE test procedure should align with the equations in AHRI 1250-2020, especially where a separate equation for electric defrost and hot gas defrost is used. (CA IOUs, No. 4, p. 3) DOE agrees that a

full analysis of AHRI 1250-2020 is necessary to both evaluate its consistency with the 2015 Working Group recommendations, and to better understand how updated test requirements may impact the energy conservation standards. However, DOE wishes to emphasize that the purpose of this rule is to revise the test procedure for hot gas defrost unit coolers only and addressing these other issues would be part of a future rulemaking.

Finally, NEEA suggests that DOE consider incorporating a cyclic test procedure for walk-in refrigeration systems (NEEA, No. 5, p. 3). According to NEEA, a test procedure with multiple refrigeration cycles and varying load conditions would more accurately represent the period of use for walk-in refrigeration systems. (NEEA, No. 5, p. 3). DOE appreciates the comment and will consider it in a future test procedure rulemaking, should one be initiated.

As stated in the September 2020 NOPR, DOE limited the scope of the proposal to expediently address how to test a hot gas defrost unit cooler and to resolve potential compliance issues under the energy conservation standards that currently apply. 85 FR 60724, 60724.

DOE has determined that the equations in AHRI 1250-2020 section C10.2.2 provide better representations of electric defrost energy use and heat load than those in the current DOE test procedure (Appendix C, sections 3.4.2.4 and 3.4.2.5) and hence will provide better equivalence of a hot gas defrost unit cooler's performance rating with that of an otherwise similar electric defrost unit cooler, regardless of gross capacity. The default electric defrost energy and heat values in the current DOE test procedure were validated by testing unit coolers with measured gross capacity up to 18,000 Btu/h,

representing a more limited range of capacity than the sample tested by AHRI.¹³ The default electric defrost energy and heat values provided in AHRI 1250-2020 are based on measuring the performance of a range of unit coolers, some with capacities greater than 18,000 Btu/h. Because of the greater capacity range tested in support of AHRI 1250-2020 development, DOE has determined that these values provide both the best available representation of electric defrost energy consumption associated with unit cooler defrost and better performance equivalence between hot gas defrost and electric defrost unit coolers than Appendix C. Hence, DOE is revising its test procedure for hot gas defrost low-temperature unit coolers to use the AHRI 1250-2020 equations to provide more equivalent test results between electric and hot gas defrost unit coolers.¹⁴

Based on the discussion presented in this final rule and in the September 2020 NOPR, DOE is modifying its test procedure for hot gas defrost unit coolers to use the defrost energy and heat equations from AHRI 1250-2020 when calculating AWEF.

C. Effective and Compliance Dates

The effective date for the adopted test procedure amendment will be 30 days after publication of this final rule in the *Federal Register*. EPCA prescribes that all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with an amended test procedure, beginning 180 days after publication of the final rule in the *Federal Register*.

¹³ See Docket EERE-2015-BT-STD-0016, No. 0007 at p. 31.

¹⁴ DOE has not identified an analogous issue with the use of hot gas defrost default values when testing condensing units tested alone that use hot gas defrost. The condensing unit test procedure requires the same defrost default values that were used to develop the current energy conservation standards.

(42 U.S.C. 6314(d)(1)) Manufacturers do, however, have the option to use the amended test procedure prior to that time.

EPCA provides that individual manufacturers may petition DOE for an extension of the 180-day period if the manufacturer will experience undue hardship in meeting the deadline. (42 U.S.C. 6314(d)(2)) To receive consideration, petitions must be filed with DOE no later than 60 days before the end of the 180-day period and must detail how the manufacturer will experience undue hardship. (*Id.*)

D. Test Procedure Costs, Harmonization, and Other Topics

1. Test Procedure Costs and Impact

EPCA requires that test procedures adopted by DOE not be unduly burdensome to conduct. In this document, DOE amends the existing test procedure for walk-in hot gas defrost unit coolers tested alone by revising the calculations used to determine daily defrost energy and heat contribution. DOE has determined that the amendment will not add any burden to manufacturers to conduct the test procedure for this equipment since the amendment requires only a mathematical change to the measured results and does not require any additional testing or re-testing on the part of manufacturers.

2. Harmonization with Industry Standards

DOE's established practice is to adopt relevant industry standards as DOE test procedures unless such methodology would be unduly burdensome to conduct or would not produce test results that reflect the energy efficiency, energy use, water use (as specified in EPCA) or estimated operating costs of that product during a representative

average use cycle. See 10 CFR 431.4; 10 CFR part 430, subpart C, appendix A, section 8(c). In cases where the industry standard does not meet the relevant statutory criteria, DOE will make needed modifications to these standards through rulemaking to ensure that the test procedure being adopted satisfies these criteria. *Id.*

DOE is adopting the method for determining the energy use attributable to hot gas defrost in unit coolers as detailed in AHRI 1250–2020, which is the updated version of the industry test procedure generally incorporated by reference in Appendix C. To address the determination of AWEF for hot gas defrost unit coolers as discussed in this final rule, DOE is updating the Federal test procedure consistent with AHRI 1250–2020 only in this context. As stated in the September 2020 NOPR, DOE may undertake a separate evaluation of whether amendments to the WICF test procedure are necessary more generally, and would as part of that evaluation, consider whether the existing reference to AHRI 1250-2009 at 10 CFR 431.303 should be updated to the 2020 version.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (“OMB”) has determined that this test procedure rulemaking does not constitute “significant regulatory actions” under section 3(f) of Executive Order (“E.O.”) 12866, Regulatory Planning and Review, 58 FR 51735 (Oct. 4, 1993). Accordingly, this action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs (“OIRA”) in OMB.

B. Review Under Executive Orders 13771 and 13777

On January 30, 2017, the President issued E.O. 13771, “Reducing Regulation and Controlling Regulatory Costs.” See 82 FR 9339 (Feb. 3, 2017). E.O. 13771 stated the policy of the executive branch is to be prudent and financially responsible in the expenditure of funds, from both public and private sources. E.O. 13771 stated it is essential to manage the costs associated with the governmental imposition of private expenditures required to comply with Federal regulations.

Additionally, on February 24, 2017, the President issued E.O. 13777, “Enforcing the Regulatory Reform Agenda.” 82 FR 12285 (March 1, 2017). E.O. 13777 required the head of each agency designate an agency official as its Regulatory Reform Officer (“RRO”). Each RRO oversees the implementation of regulatory reform initiatives and policies to ensure that agencies effectively carry out regulatory reforms, consistent with applicable law. Further, E.O. 13777 requires the establishment of a regulatory task force at each agency. The regulatory task force is required to make recommendations to the agency head regarding the repeal, replacement, or modification of existing regulations, consistent with applicable law. At a minimum, each regulatory reform task force must attempt to identify regulations that:

- (i) Eliminate jobs, or inhibit job creation;
- (ii) Are outdated, unnecessary, or ineffective;
- (iii) Impose costs that exceed benefits;
- (iv) Create a serious inconsistency or otherwise interfere with regulatory reform initiatives and policies;
- (v) Are inconsistent with the requirements of the Information Quality Act, or the guidance issued pursuant to that Act, in particular those regulations that rely in

whole or in part on data, information, or methods that are not publicly available or that are insufficiently transparent to meet the standard for reproducibility; or

(vi) Derive from or implement Executive Orders or other Presidential directives that have been subsequently rescinded or substantially modified.

DOE concludes that this rulemaking is consistent with the directives set forth in these executive orders. This final rule is estimated to have no cost impact. Therefore, this final rule is an E.O. 13771 “other” action.

C. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of a final regulatory flexibility analysis (“FRFA”) for any final rule where the agency was first required by law to publish a proposed rule for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, “Proper Consideration of Small Entities in Agency Rulemaking,” 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003 to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel’s website: <http://energy.gov/gc/office-general-counsel>.

As presented in this final rule, the adopted change to the test procedure will have no cost impact. As discussed, the final rule requires use of a revised calculation to determine the AWEF for hot gas defrost unit coolers. The adopted amendment does not require additional testing or retesting.

Therefore, DOE concludes that the cost effects accruing from the final rule would not have a “significant economic impact on a substantial number of small entities,” and that the preparation of a FRFA is not warranted. DOE has submitted a certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

D. Review Under the Paperwork Reduction Act of 1995

Manufacturers of walk-in coolers and walk-in freezers must certify to DOE that their products comply with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including walk-ins. (See generally 10 CFR part 429.) The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (“PRA”). This requirement has been approved by OMB under OMB control number 1910-1400. Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

The amendment adopted in this final rule does not impact the reporting burden for manufacturers of WICFs.

E. Review Under the National Environmental Policy Act of 1969

Pursuant to the National Environmental Policy Act of 1969 (“NEPA”), DOE has analyzed this proposed action in accordance with NEPA and DOE’s NEPA implementing regulations (10 CFR part 1021). DOE has determined that this rule qualifies for categorical exclusion under 10 CFR part 1021, Subpart D, Appendix A5 because it is an interpretive rulemaking that does not change the environmental effect of the rule and meets the requirements for application of a CX. See 10 CFR 1021.410. Therefore, DOE has determined that promulgation of this rule is not a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA and does not require an EA or EIS.

F. Review Under Executive Order 13132

Executive Order 13132, “Federalism,” 64 FR 43255 (August 4, 1999), imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have Federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE

examined this final rule and determined that it will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this final rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by Executive Order 13132.

G. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, “Civil Justice Reform,” 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. Section 3(b) of Executive Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation (1) clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the

extent permitted by law, this final rule meets the relevant standards of Executive Order 12988.

H. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (“UMRA”) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Public Law 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action resulting in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of \$100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed “significant intergovernmental mandate,” and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at <http://energy.gov/gc/office-general-counsel>. DOE examined this final rule according to the UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of \$100 million or more in any year, so these requirements do not apply.

I. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Public Law 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This final rule will not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

J. Review Under Executive Order 12630

DOE has determined, under Executive Order 12630, “Governmental Actions and Interference with Constitutionally Protected Property Rights” 53 FR 8859 (March 18, 1988), that this regulation will not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

K. Review Under Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB’s guidelines were published at 67 FR 8452 (Feb. 22, 2002). Pursuant to OMB Memorandum M-19-15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at

<https://www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf>. DOE has reviewed this final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

L. Review Under Executive Order 13211

Executive Order 13211, “Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,” 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any significant energy action. A “significant energy action” is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

This regulatory action is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

M. Review Under Section 32 of the Federal Energy Administration Act of 1974

Under section 301 of the Department of Energy Organization Act (Public Law 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; “FEAA”) Section 32 essentially provides in

relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (“FTC”) concerning the impact of the commercial or industry standards on competition.

The amendment to the test procedures for walk-ins adopted in this final rule does not incorporate any new industry standard that would require compliance under section 32(b) of the FEAA. The amendment adopted in this final rule is based on calculations specified in AHRI 1250-2020, but the regulation as amended does not require the use of AHRI 1250-2020. Nevertheless, DOE consulted with both the Department of Justice and the FTC on the proposed rule. Neither agency had comments or concerns regarding the rulemaking.

N. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that it has been determined that the rule is not a "major rule" as defined by 5 U.S.C. 804(2).

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final rule.

List of Subjects in 10 CFR Part 431

Administrative practice and procedure, Confidential business information, Energy conservation test procedures, and Reporting and recordkeeping requirements.

Signing Authority

This document of the Department of Energy was signed on March 7, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on March 11, 2021

Treena V. Garrett
Federal Register Liaison Officer,
U.S. Department of Energy

For the reasons stated in the preamble, DOE amends part 431 of chapter II of title 10, Code of Federal Regulations as set forth below:

**PART 431 -- ENERGY EFFICIENCY PROGRAM FOR CERTAIN
COMMERCIAL AND INDUSTRIAL EQUIPMENT**

1. The authority citation for part 431 continues to read as follows:

Authority: 42 U.S.C. 6291-6317; 28 U.S.C. 2461 note.

2. Appendix C to subpart R of part 431 is amended by revising section 3.5.2 and adding section 3.5.3 to read as follows:

**Appendix C to Subpart R of Part 431-- Uniform Test Method for the Measurement
of Net Capacity and AWEF of Walk-In Cooler and Walk-In Freezer Refrigeration
Systems**

* * * * *

3.5 * * *

3.5.2 Hot Gas Defrost Matched Systems and Single-package Dedicated Systems: Test these units as described in section 3.3 of this appendix for electric defrost matched systems and single-package dedicated systems, but do not conduct defrost tests as described in sections 3.3.4 and 3.3.5 of this appendix. Calculate daily defrost energy use as described in section 3.4.2.4 of this appendix. Calculate daily defrost heat contribution as described in section 3.4.2.5 of this appendix.

3.5.3 Hot Gas Defrost Unit Coolers Tested Alone: Test these units as described in section 3.3 of this appendix for electric defrost unit coolers tested alone, but do not

conduct defrost tests as described in sections 3.3.4 and 3.3.5 of this appendix. Calculate average defrost heat load \dot{Q}_{DF} , expressed in Btu/h, as follows:

If $\dot{Q}_{gross} \leq 25,000$ Btu/h:

$$\dot{Q}_{DF} = 0.195 \times \dot{Q}_{gross} \times \frac{N_{DF}}{24}$$

If $\dot{Q}_{gross} > 25,000$ Btu/h and
 $\dot{Q}_{gross} \leq 70,000$ Btu/h:

$$\dot{Q}_{DF} = \dot{Q}_{gross} \times \left[0.195 - \frac{0.049 \times (\dot{Q}_{gross} - 25,000)}{45,000} \right] \times \frac{N_{DF}}{24}$$

If $\dot{Q}_{gross} > 70,000$ Btu/h:

$$\dot{Q}_{DF} = 0.146 \times \dot{Q}_{gross} \times \frac{N_{DF}}{24}$$

Where:

\dot{Q}_{gross} is the measured gross capacity in Btu/h at the Suction A condition; and

N_{DF} is the number of defrosts per day, equal to 4.

Calculate average defrost power input $\dot{D}F$, expressed in Watts, as follows:

$$\dot{D}F = \frac{\dot{Q}_{DF}}{0.95 \times 3.412}$$

Where:

\dot{Q}_{DF} is the average defrost heat load in Btu/h